Subject: Informal Monthly Report for the Investigation of Stress-Corrosion Cracking of High Strength Steels Covering the Period 1 July through 31 July 1963, Report No. 0414-02-1

To: U. S. Army Ordnance Corps
Frankford Arsenal
Philadelphia, Pennsylvania

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This is the twenty-fifth in a series of monthly informal progress reports submitted in partial fulfillment of the contract. It constitutes the first monthly report on the second 1-year continuation of the original 2-year program. It was written by R. B. Setterlund who was supervised by A. Rubin.

I. OBJECTIVES

A. To study the stress corrosion characteristics of 18%-Nickel maraging steel with respect to compositional variation.

B. To study the effect of environmental temperature on the rate of stress corrosion cracking in three alloys: 18%-nickel maraging steel, a low alloy martensitic steel, and a hot-worked die steel.

C. To study the electro-potential changes occurring in 18%-nickel maraging steel during stress corrosion exposure, and the effect of applied potential.

D. To evaluate the effectiveness and applicability of surface protection on 18%-nickel maraging steel in preventing stress corrosion cracking.

II. WORK PROGRESS

A. COMPOSITIONAL VARIATION

Four heats of 18%-nickel maraging steel have been ordered. Delivery is expected in early September. The source of the material is listed below:

Supplier	Trade Name	Anticipated Yield Strength
Republic Steel	RSM 200	200 ksi
Vanadium Alloys Steel Co.	Vascomax 250	250 ksi
Latrobe Steel Co.	Marvac 18	260 ksi
Vanadium Alloys Steel Co.	Vascomax 300	300 ksi

Stress corrosion tests will be conducted on the above material using beam specimens stressed elastically to 75% of the yield strength, U-bend specimens to represent plastic deformation, and center-notched specimens to determine the tendency of stress corrosion cracks to propogate in the presence of an existing crack. Three (3) replicate tests will be conducted for each test condition. Tests will be conducted in distilled water, 3% NaCl solution, high humidity air and seacoast atmospheric exposure.

B. EFFECT OF ENVIRONMENTAL TEMPERATURE

We are presently installing immersion heaters controlled by mercury thermo-regulators to set up constant temperature baths for maintaining temperatures of 120 and 160 F. Specimens of the above four 18%-nickel maraging steel heats along with specimens of Vascojet 1000 and Ladish D6AC for comparison will be exposed to a distilled water environment at 70, 120 and 160 F to obtain data showing the temperature dependence of stress corrosion cracking susceptibility for these alloys.

C. ELECTROPOTENTIAL CHANGES

An experiment has been designed to measure the electropotential changes occurring during the stress corrosion process using the center-notch specimen employed in the third year program. The entire specimen surface with

the exception of the notch tip will be masked off, and the electrical connection made at that point. The potential of the crack surface compared to a standard calomel cell will be recorded continuously as the specimen is loaded and during the environmental exposure. This experiment is expected to yield data that will reveal the electrochemical nature of the stress-corrosion mechanism.

D. SURFACE PROTECTION

Two (2) protective coatings found to be most effective in preventing stress corrosion cracking of H-11 steel will be evaluated for applicability in protecting 18%-nickel maraging steel. The coatings selected, based on the previous years work are CAT-A-LAC 454-1-1, a chromate-inhibited epoxy, and Magna Laminar X-500, a polyurethane-type coating.

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